(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(10) International Publication Number
WO 01/43968 A1

(43) International Publication Date
21 June 2001 (21.06.2001)

PCT

(51) International Patent Classification[7]: B32B 27/12, A61F 13/15, D04H 13/00

(21) International Application Number: PCT/US00/27302

(22) International Filing Date: 4 October 2000 (04.10.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/460,760 14 December 1999 (14.12.1999) US

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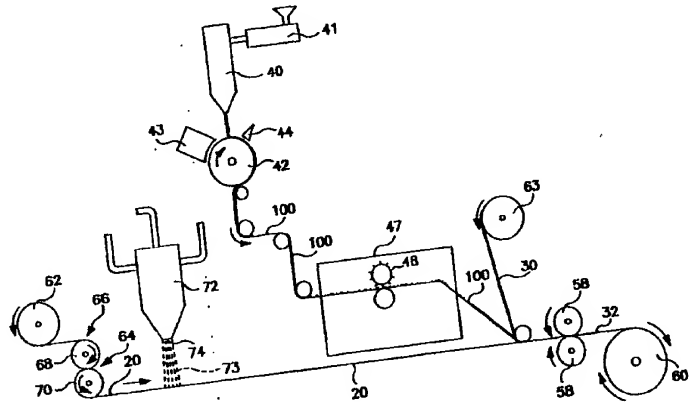
(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:
— *With international search report.*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: LIQUID TRANSFER LAMINATE PERMANENTLY CONFORMABLE TO THE CONTOURS OF A WEARER



(57) Abstract: A liquid transfer laminate is provided that is permanently conformable to the contours of a wearer's body when used in a personal care absorbent article or a medical absorbent article. The laminate includes a liquid transfer film and a fibrous nonwoven web. Both the film and the web are extendible in a cross direction to a width at least 25 % greater than an original, unstretched width upon application of a stretching force. The web and the film, and the overall laminate, exhibit little or no retractive force once they have been stretched. A diaper or other absorbent garment can be constructed in undersized fashion using the laminate, permitting material savings. When the garment is worn, the laminate stretches only where needed to provide a substantially perfect fit on the wearer. The minimal retractive force avoids the skin marks, rashes, etc. that can result from elastic garments.

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LIQUID TRANSFER LAMINATE PERMANENTLY CONFORMABLE TO THE CONTOURS OF A WEARER

FIELD OF THE INVENTION

This invention relates to a liquid transfer laminate, which is highly pervious to aqueous liquids, and which is permanently conformable to the contours of a wearer. The laminate stretches as needed to conform to the contours of a wearer and remains, essentially, in its extended or stretched state, even after a stretching force is removed.

BACKGROUND OF THE INVENTION

Materials which are highly permeable to aqueous liquids are used for top liners, surge layers, and other liquid transfer devices in a wide variety of personal care absorbent articles and medical absorbent articles. These transfer layers may be composed of fibrous nonwoven webs, in particular webs having significant open space between the fibers. Transfer layers can also be made from plastic films which have been rendered porous by slitting, aperturing, or the like, or from open-celled foam materials. Liquid transfer layers find widespread use in diapers, pant-like absorbent garments, feminine hygiene articles, medical drapes and bandages, and the like .

One trend affecting the personal care absorbent article industry, and the medical absorbent article industry, involves the demand and need for transfer materials which transfer liquid away from the wearer's skin quickly, leaving the wearer's skin dry and free of moisture-induced irritation and rash. Another trend affecting these industries involves the demand and need for products having better fit, which conform to the contours of the wearer's body. To date, much of the investigation in this area has involved use of elastic materials.

One challenge involving the use of elastic materials is that most absorbent garments have a complex layer structure. Absorbent garments typically include at least a liquid-permeable top layer, an absorbent core layer, and a breathable, substantially liquid-impermeable outer cover laminate. If one of these materials is made elastic, the absorbent garment will not necessarily be elastic. In order for the absorbent garment to have elastic

properties, each layer must either a) exhibit a desired minimum level of stretching and retraction, or b) be "free floating" and not attached to the elastic or extendible layers.

Another challenge of using elastic materials to promote conformability is the conversion of kinetic energy to potential energy during stretching. The stored potential energy in the stretched regions of the garment creates a retractive force which acts against the wearer's body, causing compression of the skin and discomfort. Wherever an elastic garment is stretched in selected regions to conform to a wearer's body, the garment will exhibit a tighter fit in the stretched regions. Skin ripples, red marks or even rashes may form where the elastic material exhibits the greatest retractive force against the wearer's skin. These problems become more acute when the garment contains more than one elastic layer.

There is a need or desire in the industries of personal care absorbent garments and medical garments, for less expensive materials which stretch in order to conform to the contours of a wearer's body. There is also a need or desire for materials which do not store significant amounts of potential energy when stretched, and which do not exhibit excessive retractive force against the wearer's body. In short, there is a need or desire for materials and garments which remain stretched, i.e., which permanently conform to the contours of the wearer's body.

SUMMARY OF THE INVENTION

The present invention is directed to a liquid transfer laminate including at least one thermoplastic nonwoven filament web and at least one liquid transfer film laminated to it. The liquid transfer laminate has a machine direction (direction of formation) which corresponds to a primary direction of orientation of the nonwoven filaments, and a cross direction which is perpendicular to the machine direction. The liquid transfer laminate is extendible in the cross direction to a stretched width that is at least 25% greater than an original, unstretched width upon application of a stretching force. When the stretching force is removed, the liquid transfer laminate either does not retract, or retracts by not more than 30% of the difference between the stretched width and the original width.

The liquid transfer laminate includes a liquid transfer film having cross-directional extendibility at least as great as the laminate, and a fibrous nonwoven web, bonded to the film, which also has cross-directional extendibility at least as great as the

laminate. The component which has the least cross-directional extendibility (whether the film or the web) will limit the cross-directional extendibility of the entire laminate. In other words, the laminate will extend to the same or a lesser extent than the least extendible layer. Similarly, neither the film nor the web should exhibit significantly more retractive force than is desired for the laminate in general. If either the film or the web has a tendency to retract by more than 30% of the difference between its stretched width and original unstretched width, then the overall laminate may retract too much or apply excessive retractive force against the wearer's body.

The extendible liquid transfer film may be a cast or blown film of a thermoplastic polymer which has been apertured, slitted, or otherwise processed to promote liquid transfer. Extendible polymer films which have been apertured or slitted are preferred. The liquid transfer film may also be an open-celled foam layer.

In one embodiment, the thermoplastic nonwoven filament web is a neck-stretched nonwoven web, for example, a neck-stretched spunbond web. The nonwoven web, which is made of a relatively inelastic polymer material, is extended in the machine direction to cause narrowing or neck-in of the web in the cross direction. The web is laminated and bonded to a liquid transfer film while the web is in the necked condition. The liquid transfer film includes at least one thermoplastic polymer which renders the film extendible (but not elastic, or highly retractable) in the cross direction. Thus, when the liquid transfer laminate is stretched in the cross direction, the film is stretched, and the nonwoven web returns toward its original, un-necked state. The stretched laminate exhibits little or no retractive force after being held for one minute in the stretched condition. In this embodiment, the laminate has cross-directional extendibility but may not have machine direction extendibility if the nonwoven web is made from a non-extendible polymer composition.

In another embodiment, the thermoplastic nonwoven web is not necessarily neck-stretched, but is made using an extendable (but not elastic, or highly retractable) polymer material. The liquid transfer film also includes at least one thermoplastic polymer which renders the film extendible (but not elastic, or highly retractable) in the cross direction. When the liquid transfer laminate is stretched in the cross direction, the film is stretched, and

the fibers in the nonwoven web are also stretched. The stretched laminate exhibits little or no retractive force. In this embodiment, the laminate may have extendibility in the machine direction as well as the cross-direction, since both the film and web are made from extendible polymers.

In another embodiment, the thermoplastic web is not necessarily neck-stretched or made using a stretchable polymer. Instead, the nonwoven web is rendered stretchable by crimping of the filaments. Crimped filaments have undulations and/or spirals along their length which tend to straighten out when a stretching force is applied, thus rendering the filaments stretchable or elongatable. Again, the liquid transfer film includes at least one thermoplastic polymer which renders the film extendible (but not elastic, or highly retractable) in the cross direction. When the laminate is stretched in the cross direction, the film is stretched, and the crimped filaments of the nonwoven web tend to straighten out. Again, the stretched laminate exhibits little or no retractive force. In this embodiment, the laminate may have extendibility in the machine direction as well as the cross-direction, since the film is made from an extendible polymer and the web will stretch in either direction.

With the foregoing in mind, it is a feature and advantage of the invention to provide a liquid transfer laminate which stretches where needed, and exhibits little retractive force, thereby conforming permanently to the contour of a wearer's body.

It is also a feature and advantage of the invention to provide a liquid transfer laminate which conforms to the contours of a wearer's body, and which is relatively inexpensive to manufacture compared to prior art elastic laminates.

It is also a feature and advantage of the invention to provide various personal care and medical garments which incorporate the liquid transfer laminate of the invention, and which (due to their extendibility and low retraction) permanently conform to the contour of a wearer's body.

The foregoing and other features and advantages will become further apparent from the following detailed description of the presently preferred embodiments, read in conjunction with the accompanying drawings. The detailed description and drawings are

intended to be illustrative rather than limiting, the scope of the invention being defined by the appended claims and equivalents thereof.

DEFINITIONS

The term "extendible" is used herein to mean a material which upon application of a stretching force, can be extended in a particular direction, to a stretched dimension (e.g., width) which is at least 25% greater than an original, unstretched dimension. When the stretching force is removed after a one-minute holding period, the material does not retract, or retracts by not more than 30% of the difference between the stretched dimension and the original dimension. Thus, a material having a width of one meter, which is extendible in the cross direction, can be stretched to a width of at least 1.25 meters. When the stretching force is released after holding the extended width for one minute, a material stretched to a width of 1.25 meters will not retract, or will retract to a width of not less than 1.175 meters. Extendible materials are different from elastic materials, the latter tending to retract most of the way to their original dimension when a stretching force is released. The stretching force can be any force sufficient to extend the material to between 125% of its original dimension, and its maximum stretched dimension in the selected direction (e.g. the cross-direction) without rupturing it.

The "percent retraction" is determined when the retractive force drops below 10 grams for a 3-inch wide sample, using the procedure set forth in the examples. "percent permanent set" is 100 minus "percent retraction."

The term "inelastic" refers both to materials that do not stretch by 25% or more and to materials that stretch by that amount, but do not significantly retract. Inelastic materials include extendible materials, as defined above, as well as materials that do not extend, e.g., which tear when subjected to a stretching force.

The term "machine direction" as applied to a nonwoven web, refers to the direction of travel of a conveyor passing beneath the spinnerette or similar extrusion or forming apparatus for the filaments, which causes the filaments to have primary orientation in the same direction. While the filaments may appear wavy, or even randomly oriented in a localized section of a nonwoven web, they usually have an overall machine direction of

orientation which was parallel to the movement of the conveyor that carried them away from the extrusion or forming apparatus.

The term "machine direction" as applied to a film, refers to the direction on the film that was parallel to the direction of travel of the film as it left the extrusion or forming apparatus. If the film passed between nip rollers or chill rollers, for instance, the machine direction is the direction on the film that was parallel to the surface movement of the rollers when in contact with the film.

The term "machine direction" as applied to a laminate including at least one film and at least one nonwoven web, refers to the machine direction of the nonwoven web component of the laminate.

The term "cross direction" for a nonwoven web, film, or laminate refers to the direction perpendicular to the machine direction. Dimensions measured in the cross direction are referred to as "width" dimensions, while dimensions measured in the machine direction are referred to as "length" dimensions.

The term "liquid transfer material" refers to a material present in one or more layers, such as a fibrous nonwoven fabric, apertured film or open-celled foam, which has an open or porous structure, and which is water permeable due to the flow of water and other aqueous liquids through the apertures or other openings. For a nonwoven web to be a liquid transfer material, 1) the spaces between its fibers or filaments must be large enough and frequent enough to permit leakage and flow of liquid water through the web, 2) there must be a surfactant present to reduce the surface tension enough to wet the material, or 3) the nonwoven must be perforated. For a film to be a liquid transfer material, it must have apertures, slits or other openings large enough and frequent enough to permit leakage and flow of liquid water through the film.

The term "liquid transfer laminate" refers to a combination of two or more liquid transfer materials, for instance, a liquid transfer film and a liquid transfer nonwoven web, which combination acts as a liquid transfer material.

The term "nonwoven fabric or web" means a web having a structure of individual fibers or threads which are interlaid, but not in a regular or identifiable manner as in a knitted fabric. Nonwoven fabrics or webs have been formed from many processes such

as, for example, meltblowing processes, spunbonding processes, air laying processes, conforming processes, and bonded carded web processes. The basis weight of nonwoven fabrics is usually expressed in ounces of material per square yard (osy) or grams per square meter (gsm) and the fiber diameters useful are usually expressed in microns. (Note that to convert from osy to gsm, multiply osy by 33.91.)

The term "microfibers" means small diameter fibers typically having an average fiber denier of about 0.005-10. Fiber denier is defined as grams per 9000 meters of a fiber. For a fiber having a circular cross-section, denier may be calculated as fiber diameter in microns squared, multiplied by the density in grams/cc, multiplied by 0.00707. For fibers made of the same polymer, a lower denier indicates a finer fiber and a higher denier indicates a thicker or heavier fiber. For example, the diameter of a polypropylene fiber given as 15 microns may be converted to denier by squaring, multiplying the result by .89 g/cc and multiplying by .00707. Thus, a 15 micron polypropylene fiber has a denier of about 1.42 calculated as (15^2 x 0.89 x .00707 =1.415). Outside the United States the unit of measurement is more commonly the "tex," which is defined as the grams per kilometer of fiber. Tex may be calculated as denier/9.

The term "spunbonded fibers" refers to small diameter fibers which are formed by extruding molten thermoplastic material as filaments from a plurality of fine capillaries of a spinnerrette having a circular or other configuration, with the diameter of the extruded filaments then being rapidly reduced as by, for example, in U.S. Patent 4,340,563 to Appel et al., and U.S. Patent 3,692,618 to Dorschner et al., U.S. Patent 3,802,817 to Matsuki et al., U.S. Patents 3,338,992 and 3,341,394 to Kinney, U.S. Patent 3,502,763 to Hartmann, U.S. Patent 3,502,538 to Petersen, and U.S. Patent 3,542,615 to Dobo et al., each of which is incorporated herein in its entirety by reference. Spunbound fibers are quenched and generally not tacky when they are deposited onto a collecting surface. Spunbound fibers are generally continuous and often have average deniers larger than about 0.3, more particularly, between about 0.6 and 10.

The term "meltblown fibers" means fibers formed by extruding a molten thermoplastic material through a plurality of fine, usually circular, die capillaries as molten threads or filaments into converging high velocity heated gas (e.g., air) streams which

attenuate the filaments of molten thermoplastic material to reduce their diameter, which may be to microfiber diameter. Thereafter, the meltblown fibers are carried by the high velocity gas stream and are deposited on a collecting surface to form a web of randomly dispersed meltblown fibers. Such a process is disclosed for example, in U.S. Patent 3,849,241 to Butin et al. Meltblown fibers are microfibers which may be continuous or discontinuous, are generally smaller than about 1.0 denier, and are generally self bonding when deposited onto a collecting surface.

The term "film" refers to a thermoplastic film made using a film extrusion and/or foaming process, such as a cast film or blown film extrusion process. This term includes apertured films, slit films, and other porous films which constitute liquid transfer films, as well as films which do not transfer liquid. The term also includes film-like materials that exist as open-celled foams.

The term "polymer" includes, but is not limited to, homopolymers, copolymers, such as for example, block, graft, random and alternating copolymers, terpolymers, etc. and blends and modifications thereof. Furthermore, unless otherwise specifically limited, the term "polymer" shall include all possible geometrical configurations of the material. These configurations include, but are not limited to isotactic, syndiotactic and atactic symmetries.

The term "absorbent article" includes personal care absorbent products and medical absorbent products. The term "personal care absorbent product" includes without limitation diapers, training pants, swim wear, absorbent underpants, baby wipes, adult incontinence products, and feminine hygiene products.

The term "medical absorbent product" includes without limitation absorbent garments, underpads, bandages, face masks, absorbent drapes, and medical wipes.

The term "neck" or "neck stretch" interchangeably means that the fabric, nonwoven web or laminate is drawn such that it is extended under conditions reducing its width or its transverse dimension by stretching lengthwise or increasing the length of the fabric. The controlled drawing may take place under cool temperatures, room temperature or greater temperatures and is limited to an increase in overall dimension in the direction being drawn up to the elongation required to break the fabric, nonwoven web or laminate,

which in most cases is about 1.2 to 1.6 times. When relaxed, the fabric nonwoven web or laminate does not return totally to its original dimensions. The necking process typically involves unwinding a sheet from a supply roll and passing it through a brake nip roll assembly driven at a given linear speed. A take-up roll or nip, operating at a linear speed higher than the brake nip roll, draws the fabric and generates the tension needed to elongate and neck the fabric. U.S. Patent No. 4,965,122 issued to Morman, and commonly assigned to the assignee of the present invention, discloses a reversibly necked nonwoven material which may be formed by necking the material, then heating the necked material, followed by cooling and is incorporated herein by reference in its entirety. The heating of the necked material causes additional crystallization of the polymer giving it a partial heat set. If the necked material is a spunbond web, some of the fibers in the web may become crimped during the necking process, as explained in U.S. Patent 4,965,122.

The term "neckable material" or "neckable layer" means any material or layer which can be necked such as a nonwoven, woven, or knitted material. As used herein, the term "necked material" refers to any material which has been drawn in at least one dimension, (e.g., lengthwise), reducing the transverse dimension, (e.g., width), such that when the drawing force is removed, the material can be pulled back to its original width. The necked material has a higher basis weight per unit area than the un-necked material. When the necked material is pulled back to its original width, it should have about the same basis weight as the un-necked material. This differs from stretching/orienting the film layer, during which the film is thinned and the basis weight is reduced. Preferred nonwoven webs for use in the invention are made from an inelastic polymer.

The term "percent neckdown" refers to the ratio determined by measuring the difference between the un-necked dimension and the necked dimension of the neckable material and then dividing that difference by the un-necked dimension of the neckable material.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 illustrates a fibrous nonwoven web, which can be a spunbound web, which has not been necked.

Fig. 2 illustrates a fibrous nonwoven web, which can be a spunbound web, which has been necked.

Fig. 3 illustrates a plan view of an apertured liquid transfer film which can be laminated to the nonwoven web of Fig. 1 or Fig. 2.

Fig. 4 schematically, illustrates a process that can be used to form the liquid transfer laminates of the invention.

DETAILED DESCRIPTION OF THE PRESENTLY PREFERRED EMBODIMENTS

Referring to Fig. 1, a nonwoven web 10, which can be spunbond web, includes a plurality of individual thermoplastic fiber elements 12 intermittently bonded together using a bonding pattern which, in this instance, includes a plurality of point bonds 14. The individual fibers 12 have a wavy or somewhat random orientation when viewed on a microscopic scale. When viewed on a microscopic scale, taking into account the entire lengths of fibers 12, the fibers 12 have an overall primary direction of orientation which is parallel to a machine direction, represented by arrow 16. If the nonwoven web is spunbond, it may be intentionally produced with a high machine direction filament orientation, and thermal bonds oriented primarily in the machine direction. This will provide the spunbond web with inherent cross-directional extendibility, much like that existing in a conventional bonded carded web.

The nonwoven web 10 is preferably a spunbond web, but can also be a meltblown web, a bonded carded web, an air laid web, or a laminate or composite including one or more nonwoven webs. The nonwoven web may also be formed or modified using a hydraulic entangling process. In one embodiment of the invention, the nonwoven web or laminate including it, is neckable, as defined above. Fig. 2 illustrates a necked nonwoven material 20, which can be the nonwoven web 10 stretched in the machine direction 16 to cause elongation of the web in the machine direction 16 and narrowing, or neck-in, in the cross direction 18. As shown in Fig. 2, necking causes the individual filaments 12 to become more aligned with each other, and closer to each other. When a neckable nonwoven web or laminate is employed, it should have a percent neck-down of at least about 15%, more preferably about 25-75%, most preferably about 35-65%. Prior to necking, the nonwoven

web 10 should have a basis weight of about 0.05-4.0 ounces per square yard. ("osy"), preferably about 0.3-2.0 osy, more preferably about 0.4-1.0 osy.

When a neckable nonwoven web is used, the nonwoven web can be constructed from either a non-extendible or an extendible polymer. Examples of suitable non-extendible polymers include, without limitation, polyolefins, polyamides, and polyesters. Preferred polymers include polyolefins, such as polypropylene and/or polyethylene. Other suitable polymers include copolymers of mainly ethylene and C_3-C_{12} alpha-olefins, having a density of about 0.900-0.935 grams 1 cm^3, commonly known as linear low density polyethylenes. Also included are copolymers of at least 90% by weight propylene with not more than 10% by weight C_2 or C_4-C_{12} alpha-olefins. Extendible polymers (as described below), which are preferred when the nonwoven web 10 is not neck-stretched or the fibers crimped, may also be used when its neck-stretched. Single-site catalyzed polyolefins (i.e., metallocene-catalyzed or constrained geometry-catalyzed) are also useful. These polylefins may be extendible or not extendible, depending on their density and monomer content. Single-site catalyzed polyolefins are described in U.S. Patents 5,571,619; 5,322,728; and 5,272,236, the disclosures of which are incorporated by reference.

Polymers made using single-site catalysts have a very narrow molecular weight range. Polydispersity numbers (Mw/Mn) of below 4 and even below 2 are possible for metallocene-produced polymers. These polymers also have a controlled short chain branching distribution compared to otherwise similar Ziegler-Natta produced type polymers. It is also possible using a metallocene catalyst system to control the isotacticity of the polymer quite closely. In general, polyethylene polymers and copolymers having a density of 0.900 grams/cc or greater tend to be less extendible or not extendible, while those having a density below 0.900 grams/cc are more extendible. In general, polypropylene polymers and copolymers containing 0-10% of an ethylene or other alpha-olefin comonomer tend to be less extendible or not extendible, while propylene-alpha olefin copolymers containing more than 10% comonomer are more extendible.

Commercial production of single-site catalyzed polymers is somewhat limited but growing. Such polymers are available from Exxon Chemical Company of Baytown, Texas under the trade name ACHIEVE for polypropylene based polymers and EXACT and

EXCEED for polyethylene based polymers. Dow Chemical Company of Midland, Michigan has polymers commercially available under the name AFFINITY. These materials are believed to be produced using non-stereo selective metallocene catalysts. Exxon generally refers to their catalyst technology as single site or metallocene catalysts while Dow refers to theirs as "constrained geometry" catalysts under the name INSITE® to distinguish them from traditional Ziegler-Natta catalysts which have multiple reaction sites. Other manufacturers such as Fina Oil, BASF, Amoco, Hoechst and Mobil are active in this area and it is believed that the availability of polymers produced according to this technology will grow substantially in the next decade.

In a second embodiment, the cross direction extendible nonwoven web 10 is not neck-stretched. In this embodiment, the nonwoven web 10 is made from an extendible polymer material, i.e., one which permits the individual fibers 12 to stretch by at least 25% of their initial length, and not retract by more than 30% of the difference between the stretched length and the unstretched length when a stretching force is removed. Preferably, the extendible polymer is one which permits the individual fibers 12 to stretch by at least 35% (e.g. 35-300%) of their initial length, and not retract by more than 30% of the difference between the stretched and unstretched lengths when the stretching force is removed. More preferably, the extendible polymer permits the individual fibers 12 to stretch by at least 50% (e.g. 50-200%) of their initial, unstretched length and not retract more than 30% of said difference. The extendible fibers 12 may be composed of a blend or other combination of an extendible and non-extendible polymer, so long as the extendible polymer is present in sufficient quantity to render the fibers extendible.

Examples of extendible polymers include certain flexible polyolefins, for example propylene-based polymers having both atactic and isotactic propylene groups in the main polypropylene chain. Flexible polyolefins (FPO's) are sold by the Rexene Corporation. Also included are heterophasic propylene-ethylene copolymers sold as "catalloys" by the Himont Corporation. Heterophasic polymers are reactor blends formed by adding different levels of propylene and ethylene at different stages in the reactor. Heterophasic polymers typically include about 10-90% by weight of a first polymer segment A, about 10-90% by weight of a second polymer segment B, and 0-20% by weight of a third polymer segment C.

Polymer segment A is at least about 80% crystalline and includes about 90-100% by weight propylene, as a homopolymer or random copolymer with up to 10% by weight ethylene. Polymer segment B is less than about 50% crystalline, and includes about 30-70% by weight propylene randomly copolymerized with about 30-70% by weight ethylene. Optional polymer segment C contains about 80-100% by weight ethylene and 0-20% of randomly copolymerized propylene.

Other extendible polymers include very low density polyethylene (VLDPE), which is an ethylene-alpha olefin copolymer having a density less than 0.900 grams/cm^3, preferably about 0.870-0.890 grams/cm^3. Preferred VLDPE's are single-site catalyzed. Other extendible polymers include random propylene-alpha olefin copolymers containing more than 10% by weight of a C_2 or C_4-C_{12} comonomer, preferably about 15-85% by weight of the comonomer, with ethylene being a preferred comonomer.

In a third embodiment, the cross direction extendible nonwoven web 10 is made of fibers 12 that are crimped. A wide variety of crimping processes are known in the art. Crimped fibers have accordion-like or spring-like undulations or microundulations so that when the fibers are extended, they straighten out and/or the undulations are reduced in amplitude. When crimped fibers are used, the polymer of construction need not be extendible, i.e., may be extendible or not extendible.

In yet another embodiment, the nonwoven is formed so that the fibers have very high machine direction (MD) and very little cross direction (CD) orientation. The fibers are then bonded so as to minimize CD bonding of the fibers. This allows the material to extended in the CD. An example of such a material is a bonded carded web (BCW) nonwoven that has high CD extendibility and low MD extendibility. Other nonwovens, such as spunbonds, can be made to perform like BCW's by forming the spunbond fibers so that the fibers are highly oriented in the MD and bond the filaments with a bond pattern so that the material can readily extend in the CD. Such a bond pattern would have lower percent bond area (less than 25%) with the bonds lined up predominately in the MD. Thus there are columns of fibers in the MD which are not bonded adjacent to columns of fibers in the MD that are. The unbonded fibers allow the nonwoven to readily extend in the CD while the bonded fibers give the material strength and abrasion resistance. BCW materials are

described further in Encyclopedia of Polymer Science and Engineering, volume 10, pages. 211-212, Wiley & Sons (1987), which is incorporated by reference.

Fig. 3 illustrates an extendible liquid transfer film that can be laminated to the neck-stretched nonwoven web of the first embodiment, the extendible polymer-based nonwoven web of the second embodiment, or the crimped nonwoven web of the third embodiment. The extendible liquid transfer film 100 can include a polymer matrix 111 and a plurality of openings 113 within the matrix, passing from one surface to the other of film 100. The openings 113 can be in the form of apertures (as shown), slits (not shown), or any other form as long as the openings 113 are of sufficient size, and density or frequency, to readily facilitate aqueous liquid transfer through the film 100.

The openings 113 in the film 100 can be characterized in terms of an "open area ratio," according to the following equation:

$$\text{Open area ratio (\%)} = \frac{\text{total area occupied by openings}}{\text{total area of film sample}} \times 100\%$$

For instance, if a one square meter film sample has 0.5 square meters of openings 113, then the film has an open area ratio of 50%. Because the primary function of the film 100 is liquid transfer, it should have an open area ratio of about 10-90%, preferably about 25-75%, more preferably about 40-60%.

The diameter or width of individual openings 113 is also important to maintaining proper liquid transfer through the film 100. If the openings 113 are too large, the film space between openings will also tend to be larger, and some of the liquid may remain on the film space between the openings instead of passing through them. If the openings 113 are too small, then surface tension between the film 100 and aqueous liquid may make it more difficult for the liquid to pass through the openings 113. The openings 113 may each have an average area (measured as the planar area of an opening at the film surface) of about 1-5000 mm^2, desirably about 10-1000 mm^2, preferably about 50-500 mm^2.

The polymer matrix 111 can be formed from any extendible film-forming thermoplastic polymer. Examples of suitable polymers include without limitation any one or more of the extendible polymers named above for the second embodiment of the nonwoven web having extendible fibers. The extendible polymer should be of a type and

amount that causes the film 100 to have cross-directional extendibility of at least about 25% of an initial, unstretched width when a stretching force is applied. When the stretching force is relaxed, the film should not retract by more than 30% of the difference between the stretched width and the initial, unstretched width. Preferably, film 100 should have cross-directional extendibility of at least about 35% (e.g. 35-300%) of the initial width, more preferably at least about 50% (e.g. 50-200%). The extendible polymer may be blended with a non-extendible polymer so long as the film has the needed extendibility. Preferred polymers for the matrix 111 are single-site catalyzed ethylene copolymers and flexible polyolefins (FPOs) as described above.

The liquid transfer film 100 may have a thickness of about 1-100 microns, suitably about 5-50 microns, desirably about 10-30 microns. The film 100 should be thick enough so that it can be extended without rupturing, yet not so thick as to unnecessarily raise the cost.

Figure 4 illustrates one integrated process for forming a liquid transfer film and a laminate. Referring to Figure 4, film 100 is formed from a film extrusion apparatus 40 such as a cast or blown unit which could be in-line or off-line. The apparatus 40 is fed by an extruder 41. The film 100 is extruded onto a chill roller 42, which cools it. A vacuum box 43 adjacent the chill roller creates a vacuum on the surface of the chill roller to help maintain the film close to the surface of the chill roller. Air knives or electrostatic pinners 44 also urge the film 100 against the roller surface.

From the film extrusion apparatus 40 or off-line rolls supplied, the film 100 is directed to a perforating unit 47 (represented schematically as a box) which can be an aperturing device 48 with one or more aperturing rollers, a film slitting device capable of forming multiple, non-continuous slits, or another conventional perforating device. The perforating device renders the film 100 liquid-permeable by forming the openings 113 passing through the polymer matrix 111. Alternatively, both the film and web may be perforated after the laminate is formed, as described below.

The liquid transfer film 100 may be laminated to one or more of the fibrous nonwoven webs 10 or 20, using conventional adhesive bonding or thermal bonding techniques known in the art. The type of substrate and bonding will vary depending on the

particular end use application. Referring again to Fig. 4, liquid transfer film 100 may be laminated to nonwoven web 20 immediately after the film is stretched. In one embodiment, a neckable nonwoven web 20, which can be a spunbound web, is unwound from a supply roll 62. The neckable material 20 then passes through the nip 64 of S-roll arrangement 66, formed by a stack of rollers 68-70, in a reverse S-wrap path as shown by the arrows. Rollers 68 and 70 turn at a slower circumferential speed than downstream calender bonding rollers 58, causing tensioning and neck-in of web 20. The tensioned, necked material can be passed under spray equipment 72 (e.g. a meltblown die head) which sprays adhesive 73 through die head 74 onto a surface of web 20. With or without the adhesive treatment, the necked web 20 can then be joined to liquid transfer film 100 and bonded between calender rollers 58, which can be heated if necessary. The film 100 in Fig. 4 is simultaneously bonded on its other side to a second extendible material 30 originating from supply roll 63. The second material 30 may be a second nonwoven web, or another liquid transfer film layer which is simultaneously perforated with the first liquid transfer film. The resulting laminate 32 is wound and stored on a supply roll 60. In addition to the described bonding technique, other bonding techniques (e.g., other thermal, adhesive or ultrasonic bonding) may be employed.

The desired cross-directional extendibility in laminate 32 is preferably achieved by aligning extendible liquid transfer film 100 with the cross direction extendible web 20, so that both are traveling in their respective machine directions during bonding, and the machine directions of the film and web are substantially parallel to each other. If the nonwoven web 20 is necked web, the cross-directional extendibility of the laminate is achieved by returning the web toward its initial, un-necked state as the film and web are extended in the cross direction. If the nonwoven web is not necked but made of an extendible polymer, then its fibers are extended as the film is extended in the cross direction. If the nonwoven web is made from crimped fibers, then its fibers merely become less crimped or un-crimped as the film is extended in the cross direction. The fibers can be both crimped and made from an extendible polymer, or present in a bonded carded web. Alternatively, if the film 100 is extendible more in its machine direction than in its cross direction, the liquid transfer laminate may be prepared by aligning the machine direction of the film with the cross direction of the nonwoven web.

The overall laminate 32 has cross-directional extendibility influenced by the extendibilities of the film and nonwoven web. Specifically, the laminate has a cross-directional extendibility of at least 25% of its initial width, preferably at least 35% (e.g. 35-300%) of its initial width, more preferably at least 50% (e.g. 50-200%) of its initial width when a stretching force is applied, without rupturing the laminate. When the stretching force is removed, the laminate does not recover or retract by more than 30% of the difference between the fully stretched width and the original width.

Another way to characterize the laminate of the invention, is in terms of the percent drop in retractive force experienced during a one-minute holding period in the stretched condition. The procedure for measuring the percent drop in retractive force is set forth below in the Examples. Briefly, a sample of the laminate material is extended in the cross direction by 50% of its initial width. The retractive force is measured immediately after extending the material by 50%, and after a one-minute holding period in the extended condition. The percent force drop is calculated as:

$$\% \text{ force drop} = 100 \text{ X} \left| \frac{\text{retractive force (time=0)} - \text{retractive force (time=60 sec)}}{\text{retractive force (time=0)}} \right|$$

To stay within the limited retraction required by the invention, the laminate should exhibit a percentage force drop of at least about 35%, preferably at least about 45%.

The cross direction extendible, liquid transfer laminate may be used in a wide variety of personal care absorbent articles and medical articles. The laminate is especially useful as a liquid transfer top liner. Personal care absorbent articles include without limitation diapers, training pants, swim wear, absorbent underpants, adult incontinence products, feminine hygiene products, and the like. Medical products include absorbent medical garments, underpads, bandages, drapes, medical wipes, and the like.

The cross direction extendible, liquid transfer laminate has the advantage of being selectively extended only in regions where stretching is needed, to conform to the contours of a wearer's body. For example, a diaper or pant-like absorbent garment embodying the laminate as a top liner can be made smaller, using less material than a diaper that is not stretchable. When the absorbent garment is applied to a wearer, it stretches in the

cross direction only where needed (for example, in the front and back of the wearer) to ensure a perfect fit. Because retractive forces are minimal, the problem of skin marks and rashes occurring in the regions of greatest stretch is substantially overcome.

EXAMPLES

Several laminates were prepared using a three-layer A-B-A cast film sold as Huntsman type 1885, available from Huntsman Packaging Corp., 199 Edison Drive, Washington, Georgia 30763. The film had a core layer containing 42% by weight linear low density polyethylene and 58% by weight calcium carbonate filler. The film had two skin layers containing a mixture of ethylene vinyl acetate (28% vinyl acetate content), and a heterophasic combination of propylene-ethylene copolymers known as Montell KS-037P catalloy. The skin layers constituted about 3% of the total film thickness.

The film was stretched in the machine direction to 3.8-4.0 times its original length, and was apertured by passing it between a heated male aperturing roller having pins protruding from its surface, and a female anvil roller. The aperturing roller was heated to 150°C and had a pin density of 8 pins per cm^2 and a pin diameter of 0.081 inches (0.206cm). The anvil roller was heated to 93°C. The resulting apertured film had an open area ratio of 14%, with apertures having a diameter of 0.206cm. Before aperturing, the film had a basis weight of 19 grams/square meters. The resulting apertured film was useful as a liquid transfer film for diaper liners and the like.

In a first set of examples (using low necked spunbond), the liquid transfer film was adhesively laminated to a reversibly necked spunbond web using 3 grams/square meter of Findlay H2525A, an adhesive made by Ato Findley of Milwaukee, Wisconsin, a division of Elf Autochem of France. The adhesive was applied with a meltblown die tip. The reversibly necked spunbond was prepared from a commercial polypropylene spunbond having a basis weight of 0.4 ounces per yd^2, pulled over 200°F heated rolls, and drawn by 6% using 100 ft/min unwind rolls and 106 ft/min re-wind rolls with a 16-foot free span between them. The drawing caused necking of the spunbond web from a 17-inch original width to an 11-inch necked width (a neck-in of 35%). The necked material was then passed over rolls heated too 200°F, to make the reversibly necked spunbond web, as described in

U.S. Patent 4,965,122, issued to Morman, the disclosure of which is incorporated by reference.

In a second set of examples (using high necked spunbond), the same meltblown adhesive was used at the same level, to bond the liquid transfer film and necked spunbond web. The highly necked spunbond was prepared from a commercial polypropylene spunbond having a basis weight of 0.5 ounces per yd^2, which was thermally point bonded at 305°F. The spunbond web was necked prior to entering and in an oven set at 260°F, from a 123-inch original width to a 44-inch necked width (a first neck-in of 64%). The web was slit to a 17-inch width. A roll of the 17-inch wide material was unwound and further necked to a 14-inch width (for a total neck-in of 70%) before being adhesively bonded to the breathable microporous film.

In a third set of Examples (using a spunbond prepared from crimped fibers), the same meltblown adhesive was used at the same level, to bind the liquid transfer film to the spunbond web. The spunbond web was thermally point bonded, and made from side-by-side bicomponent fibers. The bicomponent fibers contained 70% by weight PP3155 polypropylene from Exxon Chemical Co. of Houston, Texas; extruded adjacent to 30% by weight REXflex® FPO (flexible polyolefin) WL201 from Huntsman Chemical Corp., which is a propylene copolymer. The spunbond web had a basis weight of 0.67 ounces/square yard and a cross-directional peak elongation of 200%.

The data set forth below, for each of the Examples, were generated using the following Procedure For One Cycle/Hold Tensile Test.

Procedure For One Cycle/Hold Tensile Test

A sample of laminate material is cut to 3" long (MD) and 6" wide (CD). An MTS Sintec Model 1/S (Serial #1S/062196/197) is used to evaluate the permanent set properties of the material. The gauge length is 3", and the area of material being tested was 9 square inches (3"x 3"). The crosshead speed is set to 1000 mm/min to simulate the extension the material would experience in diaper donning. The material is held at full elongation for 60 seconds. The cycle elongation is set to the various elongations of interest. The elongation is set 3% lower than the actual target because it was found that the Sintec will

slightly overshoot the set elongation because of the high crosshead speed. For example, if a 50% elongation and hold is desired, the cycle elongation is set to 47%.

The material is clamped in the jaws. The material is stretched in the sample length (cross-direction of the material) to the desired elongation (25%, 50%, 100%, 150%, or 200%) and held in the elongated state for 60 seconds. The jaws are then returned to their original start position.

For the following Examples, two hundred data points were collected and recorded by the computer for each of the three step procedure: 1) elongation, 2) hold and 3) return to zero. The data analyzed was: 1) the force on the sample for the last data point before the crosshead stopped during the elongation step 2) the force on the sample just before the crosshead started to return to zero, 3) the actual elongation of the sample, and 4) the elongation of the sample when the force on the sample returned to 10 grams or less during the "return to zero" step.

Examples 1 and 2 (First Set)

For Example 1, the laminate prepared using the low necked spunbond material described above was extended in the cross direction by 25% of its initial width, then held for 60 seconds, then permitted to retract. For Example 2, the low necked spunbond material was extended in the cross direction by 50% of its initial width, then held for 60 seconds, then permitted to retract. Three samples were run for each Example, and the results were averaged. The following average results were determined.

Table 1

Example No.	% Extension	Force at Extended Width, grams, no delay	Force Drop at Extended Width, 1-min delay	% Permanent Set	% Retraction
1	25	591	54%	76%	24%
2	50	947	53%	78%	22%

As shown above, the laminate made using the apertured liquid transfer film and the low neck-stretched spunbond can be extended in the cross direction by 25% or 50% of its original width without rupturing. After being held at the stretched width for one

minute, the laminate retracts, in both cases, by less than 30% of the difference between the stretched width and the original unstretched width.

Examples 3 and 4 (Second Set)

For Example 3, the laminate prepared using the highly necked spunbond material described above was extended in the cross direction by 50% of its initial width, then held for 60 seconds, then permitted to retract. Similar procedures were followed for Example 4, except that the material was extended in the cross direction by 100%. Again, three samples were run for each Example, and the results were averaged. The following results were determined.

Table 2

Example No.	% Extension	Force at Extended Width, grams, no delay	Force Drop at Extended Width, 1-min delay	% Permanent Set	% Retraction
3	50	441	53%	74%	26%
4	100	630	53%	77%	23%

As shown above, the laminate made using the apertured liquid transfer film and the highly neck-stretched spunbond web can be extended in the cross direction by 50% or 100% without rupturing. After being held at the stretched width for one minute, the laminate retracts, in all cases, by less than 30% of the difference between the stretched width and the original, unstretched width.

Examples 5 and 6 (Third Set)

For Example 5, the laminate prepared using the spunbond prepared from crimped fibers, as described above, was extended in the cross direction by 50% of its initial width, then held for 60 seconds, then permitted to retract. Similar procedures were followed for Example 6, except that the laminate was extended in the cross-direction by 100%. Again, three samples were run for each Example, and the results were averaged. The following average results were determined.

Table 3					
Example No.	% Extension	Force at Extended Width, grams, no delay	Force Drop at Extended Width, 1-min delay	% Permanent Set	% Retraction
5	50	401	50%	78%	21%
6	100	656	49%	80%	19%

As shown above, the laminate made using the apertured liquid transfer film and spunbond web prepared from an extendible polymer combination, can be extended in the cross direction by 50%, 100%, 150% or 200% without rupturing. After being held at the stretched width for one minute, the laminate retracts, in all cases, by less than 30% of the difference between the stretched width and the original, unstretched width.

While the embodiments of the invention disclosed herein are presently considered preferred, various modifications and improvements can be made without departing from the spirit and scope of the invention. The scope of the invention is indicated by the appended claims, and all changes that fall within the meaning and range of equivalents are intended to be embraced therein.

WE CLAIM:

1. A liquid transfer laminate that is permanently conformable to contours of a wearer's body, the laminate comprising:

a liquid transfer film that is extendible in a cross direction to a stretched width at least 25% greater than an original, unstretched width upon application of a stretching force, and retractable by zero to not more than 30% of a difference between the stretched width and the original width upon relaxation of the stretching force; and

laminated to the film, a fibrous nonwoven web that is extendible in a cross direction to a stretched width at least 25% greater than an original, unstretched width upon application of the stretching force, and retractable by not more than 30% of a difference between the stretched width and the original width upon relaxation of the stretching force after 60 seconds.

2. The laminate of Claim 1, wherein the liquid transfer film and fibrous nonwoven web are extendible in the cross direction to stretched widths at least 35% greater than their original, unstretched widths upon application of a stretching force.

3. The laminate of Claim 1, wherein the liquid transfer film and fibrous nonwoven web are extendible in the cross direction to stretched widths at least 50% greater than their original, unstretched widths upon application of a stretching force.

4. The laminate of Claim 1, wherein the nonwoven web is neck-stretched to cause elongation in a machine direction and narrowing in its cross direction prior to being laminated to the film.

5. The laminate of Claim 1, wherein the nonwoven web comprises fibers made from an extendible polymer.

6. The laminate of Claim 1, wherein the nonwoven web comprises crimped fibers.

7. The laminate of Claim 1, wherein the film comprises an extendible polymer.

8. The laminate of Claim 1, wherein the liquid transfer film has an open area ratio of about 10-90%.

9. The laminate of Claim 1, wherein the liquid transfer film has an open area ratio of about 25-75%.

10. The laminate of Claim 1, wherein the liquid transfer film has an open area ratio of about 40-60%.

11. The laminate of Claim 1, wherein the liquid transfer film comprises an apertured film .

12. The laminate of Claim 1, wherein the liquid transfer film comprises a slitted film.

13. The laminate of Claim 1, wherein the liquid transfer film comprises an open-celled foam layer.

14. The laminate of Claim 1, wherein the nonwoven web comprises a spunbond web.

15. The laminate of Claim 1, wherein the nonwoven web comprises a meltblown web.

16. The laminate of Claim 1, wherein the nonwoven web comprises a bonded carded web.

17. The laminate of Claim 1, wherein the nonwoven web comprises an air laid web.

18. The laminate of Claim 1, wherein the nonwoven web comprises more than one layer.

19. The laminate of Claim 4, wherein the nonwoven web comprises a non-extendible polymer selected from non-extendible polyolefins, polyamides, polyesters, linear low density polyethylenes having a density of 0.900-0.935 grams/cm^3, propylene-alpha olefin copolymers containing at least 90% by weight propylene, and combinations thereof.

20. The laminate of Claim 5, wherein the nonwoven web comprises an extendible polymer selected from extendible polyolefins, ethylene-alpha olefin copolymers having a density less than 0.900 grams/cm^3, propylene-alpha olefin copolymers containing more than 10% by weight of an alpha-olefin comonomer, heterophasic propylene-ethylene copolymers, propylene polymers containing both atactic and isotactic propylene groups, and combinations thereof.

21. The laminate of Claim 1, wherein the breathable microporous film comprises an extendible polymer selected from extendible polyolefins, ethylene-alpha olefin copolymers having a density less than 0.900 grams/cm^3, propylene-alpha olefin copolymers containing more than 10% by weight of an alpha-olefin comonomer, heterophasic propylene-ethylene copolymers, propylene polymers containing both atactic and isotactic propylene groups, and combinations thereof.

22. A personal care absorbent article comprising the liquid transfer laminate of Claim 1.

23. A medical absorbent article comprising the liquid transfer laminate of Claim 1.

24. A liquid transfer laminate that is extendible in a cross direction to a stretched width at least 25% greater than an original, unstretched width upon application of a stretching force, and retractable by zero to not more than 30% of a difference between the stretched width and the original width upon relaxation of the stretching force after 60 seconds, the laminate comprising:

a liquid transfer film having cross-directional extendibility at least as great as the laminate; and

a nonwoven web having cross-directional extendibility at least as great as the laminate.

25. The laminate of Claim 24, wherein the film comprises an extendible thermoplastic polymer.

26. The laminate of Claim 24, wherein the stretched width is about 25-75% greater than the original, unstretched width.

27. The laminate of Claim 24, wherein the stretched width is about 35-65% greater than the original, unstretched width.

28. The laminate of Claim 24, wherein the nonwoven web comprises a neck-stretched material.

29. The laminate of Claim 24, wherein the nonwoven web comprises an extendible polymer material.

30. The laminate of Claim 24, wherein the nonwoven web comprises crimped fibers.

31. The laminate of Claim 24, wherein the liquid transfer film comprises an apertured film.

32. The laminate of Claim 24, wherein the liquid transfer film comprises a slitted film.

33. The laminate of Claim 24, wherein the liquid transfer film comprises an open-celled foam layer.

34. The laminate of Claim 24, wherein the liquid transfer film comprises openings having an average planar area of about 1-5000mm^2.

35. The laminate of Claim 24, wherein the liquid transfer film comprises openings having an average planar area of about 10-1000mm^2.

36. The laminate of Claim 24, wherein the liquid transfer film comprises openings having an average planar area of about 50-500mm^2.

37. A personal care absorbent article comprising the laminate of Claim 24.

38. A medical absorbent article comprising the laminate of Claim 24.

39. A liquid transfer laminate comprising:

liquid transfer film extendible in a cross direction to a stretched width at least 25% greater than an original, unstretched width upon application of a stretching force; and

a thermoplastic fibrous nonwoven web extendible in a cross direction to a stretched width at least 25% greater than an original, unstretched width upon application of the stretching force;

wherein the film and nonwoven web are aligned with a machine direction of the film substantially parallel to a machine direction of the web; and

the laminate retracts by 0-30% of a difference between a stretched width and an original, unstretched width when the stretching force is removed after 60 seconds.

40. The laminate of Claim 39, wherein the liquid transfer film comprises an apertured film.

41. The laminate of Claim 39, wherein the liquid transfer film comprises a slitted film.

42. The laminate of Claim 39, wherein the liquid transfer film comprises an open-celled foam layer.

43. The laminate of Claim 39, wherein the film and web are thermally bonded together.

44. The laminate of Claim 39, wherein the film and web are adhesively bonded together.

45. The laminate of Claim 39, wherein the film and web are ultrasonically bonded together.

46. A diaper comprising the laminate of Claim 39.

47. Training pants comprising the laminate of Claim 39.

48. Swim wear comprising the laminate of Claim 39.

49. Absorbent underpants comprising the laminate of Claim 39.

50. An adult incontinence product comprising the laminate of Claim 39.

51. A feminine hygiene product comprising the laminate of Claim 39.

52. A medical absorbent product comprising the laminate of Claim 39.

53. A liquid transfer laminate comprising:

liquid transfer film extendible in a cross direction to a stretched width at least 25% greater than an original, unstretched width upon application of a stretching force; and

a thermoplastic fibrous nonwoven web extendible in a cross direction to a stretched width at least 25% greater than an original, unstretched width upon application of the stretching force;

wherein the film and nonwoven web are aligned with a machine direction of the film substantially parallel to a machine direction of the web; and

the laminate exhibits a drop in retractive force of at least about 35% after being extended to a stretched width 50% greater than the unstretched width, and maintained at the stretched width for 60 seconds.

54. The laminate of Claim 53, wherein the drop in retractive force is at least about 45%.

55. The laminate of Claim 53, wherein the liquid transfer film comprises an apertured film.

56. The laminate of Claim 53, wherein the liquid transfer film comprises a slitted film.

57. The laminate of Claim 53, wherein the liquid transfer film comprises an open-celled foam layer.

58. The laminate of Claim 53, wherein the film and web are thermally bonded together.

59. The laminate of Claim 53, wherein the film and web are adhesively bonded together.

60. The laminate of Claim 53, wherein the film and web are ultrasonically bonded together.

61. A diaper comprising the laminate of Claim 53.

62. Training pants comprising the laminate of Claim 53.

63. Swim wear comprising the laminate of Claim 53.

64. Absorbent underpants comprising the laminate of Claim 53.

65. An adult incontinence product comprising the laminate of Claim 53.

66. A feminine hygiene product comprising the laminate of Claim 53.

67. A medical absorbent product comprising the laminate of Claim 53.

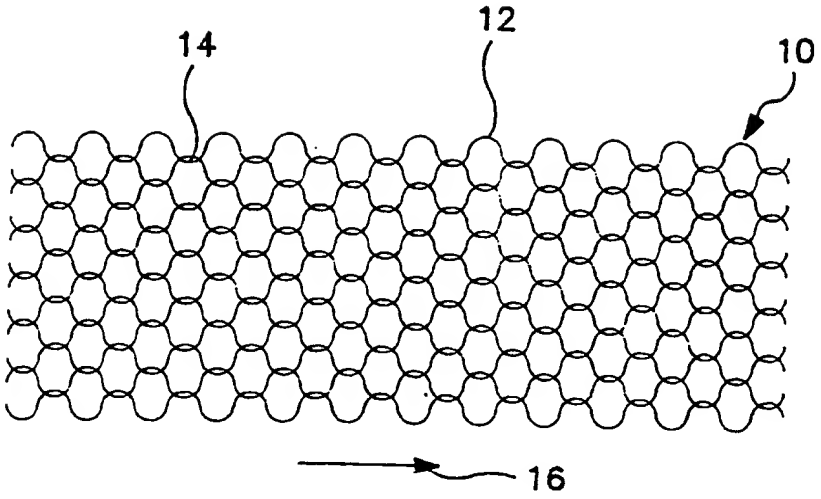

FIG. 1

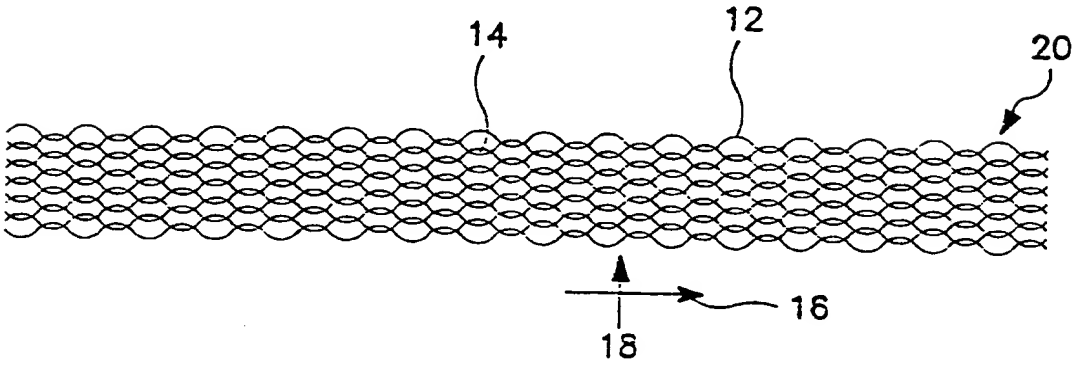

FIG. 2

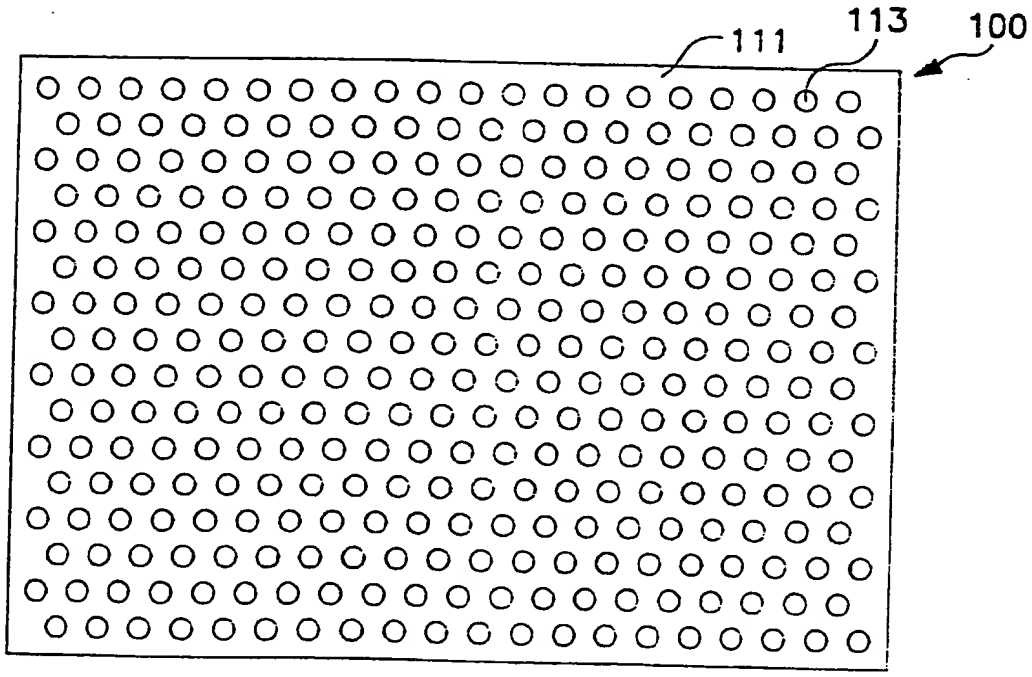

FIG. 3

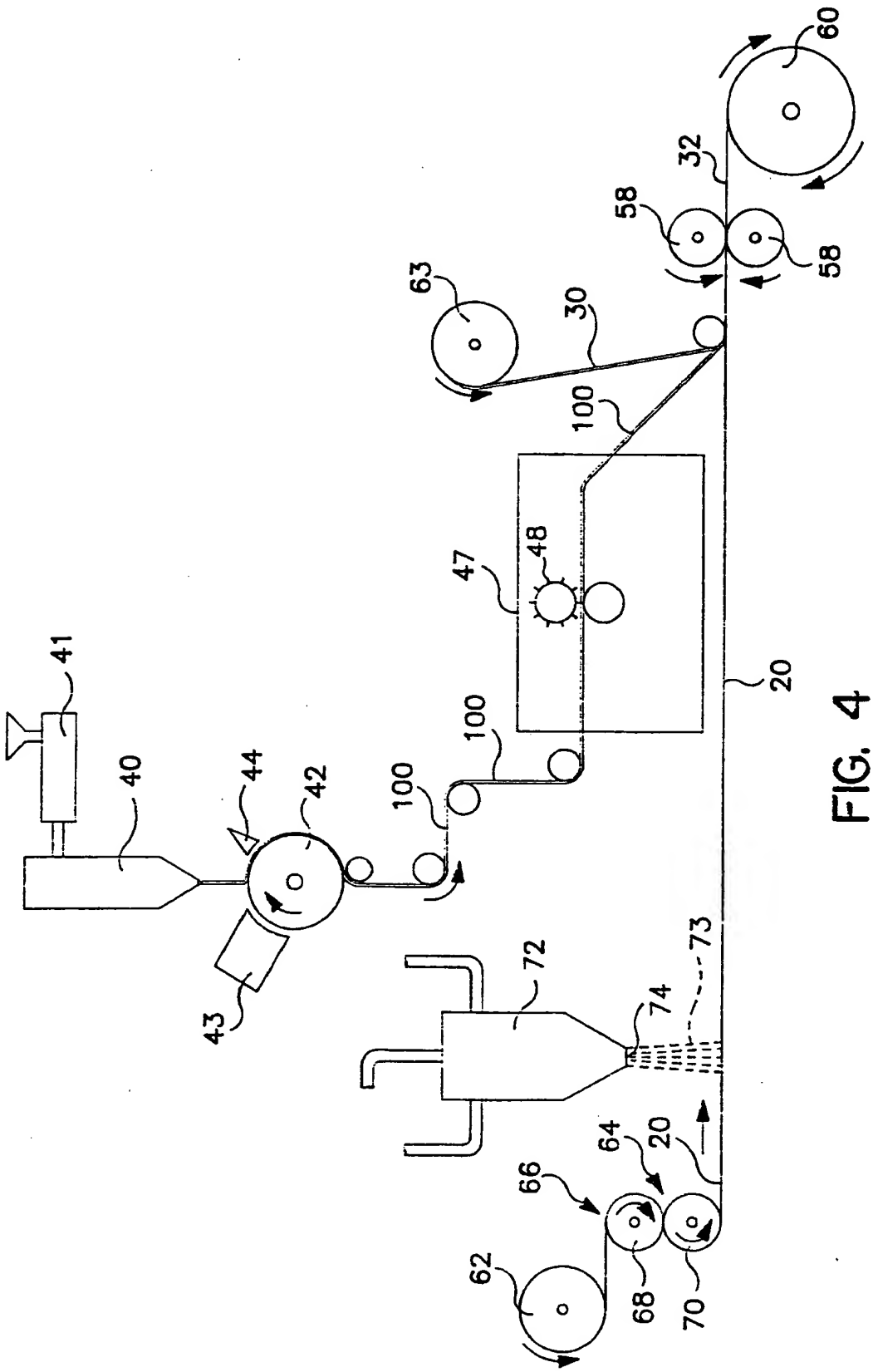
60
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FIG. 4

INTERNATIONAL SEARCH REPORT

Int tional Application No
PCT/US 00/27302

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B32B27/12 A61F13/15 D04H13/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B32B A61F D04H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, PAJ, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 536 555 A (ZELAZOSKI GREGORY A ET AL) 16 July 1996 (1996-07-16) column 2, line 49 - line 63 column 6, line 59 -column 7, line 13 examples 1-4	1-67
X	US 5 582 903 A (BOLIAN II CHARLES E ET AL) 10 December 1996 (1996-12-10) column 7, line 14 - line 37 claims 1,3,4,6	1-5, 7-29, 31-67
A	US 4 965 122 A (MORMAN MICHAEL T) 23 October 1990 (1990-10-23) column 3, line 10 - line 49 examples 1-7	1,4, 14-19, 24,28, 39,53

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
5 February 2001	16. 03. 2001
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer Stinchcombe, J

2

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

ternational application No.
PCT/US 00/27302

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☒ Claims Nos.: 1-67 (in part)
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
see FURTHER INFORMATION sheet PCT/ISA/210

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box I.2

Claims Nos.: 1-67 (in part)

Present claims 1, 24, 39 and 53 relate to a product defined (among others) by reference to parameters corresponding to the following parameters:
a) extendibility on application of a stretching force;
b) retractability on removal of stretching force;
c) drop in retractive force after stretching.

Firstly, the use of these parameters in the present context is considered to lead to a lack of clarity within the meaning of Article 6 PCT. It is impossible to compare the subject of the application, defined in terms of parameters which the applicant has chosen to employ (i.e extendibility, retractability and retractive force), with what is set out in the prior art. The lack of clarity is such as to render a meaningful complete search impossible.

Secondly, the claims cover all products having such properties, whereas the application provides support within the meaning of Article 6 PCT and disclosure within the meaning of Article 5 PCT for only a very limited number of such products. In the present case, the claims so lack support, and the application so lacks disclosure, that a meaningful search over the whole of the claimed scope is impossible.

Thirdly, and independent of the above reasoning, the claims also lack clarity (Article 6 PCT). An attempt is made to define the product by reference to a result to be achieved (i.e. specific values of parameters a, b and c) rather than by describing how to achieve the said result (e.g. use of specific materials, use of particular constructions over the prior art). Again, this lack of clarity in the present case is such as to render a meaningful search over the whole of the claimed scope impossible.

Consequently, the search has been carried out for those parts of the claims which appear to be clear, supported and disclosed, namely those parts relating to laminates for personal absorbent articles comprising one non-woven layer and one thermoplastic film layer, where the non-woven:
i) has been neck stretched, or
ii) comprises the polyolefinic fibres defined in claim 20, or
iii) comprises crimped fibres.

The applicant's attention is drawn to the fact that claims, or parts of claims, relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/US 00/27302

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